Journal of the Royal Society of Arts

NO. 4978 FRIDAY, 25TH MAY, 1956 VOL. CIV

FORTHCOMING MEETINGS

MONDAY, 28TH MAY, at 6 p.m. The last of three CANTOR LECTURES on '*Some Recent Studies of Sociology*', entitled '*Changes in Social Responsibilities*', by Roger F. Tredgold, M.A., M.D.

TUESDAY, 29TH MAY, at 5.15 p.m. COMMONWEALTH SECTION. NEIL MATHESON MCWHARRIE LECTURE. '*The Theatre and Ballet in Canada*', by Robert Speaight, M.A., F.R.S.L. His Excellency Mr. Norman A. Robertson, High Commissioner for Canada, will preside. (Tea will be served from 4.30 p.m.)

WEDNESDAY, 30TH MAY, at 2.30 p.m. '*Examinations: Do We Still Need Them?*', by Sir Griffith Williams, K.B.E., C.B., a Member of the Council of the Society, and former Deputy Secretary, Ministry of Education. Sir Edward Crowe, K.C.M.G., a Vice-President of the Society and Chairman of its Examinations Committee, will preside.

WEDNESDAY, 6TH JUNE, at 2.30 p.m. '*The Influence of National Character on Design*', by Paul Reilly, Deputy Director, Council of Industrial Design. John Gloag, Hon.A.R.I.B.A., a Member of Council of the Society, will preside. (The paper will be illustrated with lantern slides.)

Fellows are entitled to attend any of the Society's meetings without tickets (except where otherwise stated), and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.

INDUSTRIAL ART BURSARIES EXHIBITION

Fellows who were unable to visit the Society's Industrial Art Bursaries Exhibition, which closed on 18th May, are reminded that the designs are now on view at the Production Exhibition at Olympia, which is open from 10 a.m. to 5 p.m. on weekdays, including Saturdays, until 31st May.

As was announced in the *Journal* for 13th April, tickets for group visits to this Exhibition are available at reduced rates upon application to the Exhibition organizers.

LEGACY FROM THE LATE MRS. N. W. MICHAEL

A legacy of £1,000 has been received by the Society from the estate of the late Mrs. N. W. Michael. The terms of the bequest are as follows:

> I BEQUEATH to the Treasurer for the time being of the Royal Society of Arts of John Adam Street Adelphi W.C.2 in the County of London the sum of £1000 free of any duty payable by reason of my death to be invested by him in any investment from time to time sanctioned by law for the investment of trust funds upon trust to apply the income thereof in the purchase of such books as the Council for the time being of the said Society may in their absolute discretion decide to the value of the said income to be placed in the Library of the said Society to be used by all members thereof AND I DESIRE that this bequest shall be known as *The Fred Henry Andrews Bequest* AND I DECLARE that the receipt of the Treasurer for the time being of the said Society shall be a full discharge to my Trustees in respect of the same.

Mrs. Michael was the daughter of Mr. F. H. Andrews, who has been a member of Council for many years, having been first elected a Vice-President of the Society in 1935, since when he has served almost without intermission.

MEETING OF COUNCIL

A meeting of Council was held on Monday, 14th May, 1956. Present: Dr. R. W. Holland (in the Chair); Dr. W. Greenhouse Allt; Sir Alfred Bossom; Sir Edward Crowe; Mr. Robin Darwin; Mr. P. Le Neve Foster; Sir Ernest Goodale; The Earl of Halsbury; Mr. A. C. Hartley; Mr. William Johnstone; Lord Latham; Sir Harry Lindsay; Mr. F. A. Mercer; Mr. O. P. Milne; Lord Nathan; Mr. E. Munro Runtz; Sir Harold Saunders; Sir Selwyn Selwyn-Clarke; Sir John Simonsen; Sir Stephen Tallents; Sir Griffith Williams, and Mr. J. H. Wilson; with Mr. K. W. Luckhurst (Secretary), Mr. R. V. C. Cleveland-Stevens (Deputy Secretary) and Mr. David Lea (Assistant Secretary).

ELECTIONS

The following candidates were duly elected Fellows of the Society:

Behrens, Edgar Charles, C.B.E., J.P., Ilkley, Yorks.
Berry, John Arthur, A.T.D., London.
Beytagh, Dennis, Wellington, New Zealand.
Cavill, Miss Marjorie Thirza, Upminster, Essex.
Dawson, Arthur, A.C.I.S., Richmond, Yorks.
Dearden, Derek Walter, Huddersfield, Yorks.
Founds, Charles Frederick, Calgary, Alberta, Canada.
Gardner, Jack, London.
Gibson, Neil, Glasgow.
Gummerson, George Kenneth, Edinburgh.
Hines, Vivian Gerald, J.P., Colchester, Essex.
Khan, Malik Akbar Ali, London.
Lovrey, Raymond Donald, London.
Main, Douglas William Victor, B.A., Kuala Lumpur, Malaya.
Miller, Andrew Gardner, F.I.B.D., Lanark.
Minter, James George, F.A.C.C.A., London.

Monk, William George, Enfield, Middx.
Parker, David, L.R.A.M., Ipswich, Suffolk.
Parker, William Neave, Twickenham, Middx.
Pell, Horace, A.M.I.Mech.E., London.
Rao, D. Subba, M.B., B.S., B.S.Sc., M.P.H., Nungambakam, Madras, India.
Sanderson, Gordon Murray, Edinburgh.
Sherek, Henry, London.
Tristram, Mrs. Alwyn, Des.R.C.A., Brierley Hill, Staffs.
Wanless, Thomas Bellamy, Durham, Co. Durham.
Warner, Andrew Roderick, Glasgow.
White, Kenneth Charles, London.
Whitehouse, Patrick Bruce, Birmingham.
Williams, David John, M.A., B.Sc., Lancaster, Lancs.

The following was duly elected an Associate Member as a winner of an Industrial Art Bursary in 1955:

Howard, Miss Shirley, Manchester.

The following were admitted as Institutions in Union under Bye-Law 66:

The Central Association of Photographic Societies.
The Spalding Gentlemen's Society.

ALBERT MEDAL

Further consideration was given to the award of the Albert Medal for 1956 and a name was selected for submission to His Royal Highness the President.

CHAIRMAN OF COUNCIL, 1956–57

Dr. R. W. Holland was nominated to serve as Chairman of the Council for the year 1956–57.

BALLOTING LIST, 1956–57

The Balloting List for the new Council was prepared for the Annual General Meeting.

'BEAUTY IN DANGER'

It was decided to appoint a Committee, with Sir Stephen Tallents as Chairman, to advise the Council regarding possible action to follow up the recent lectures on 'Beauty in Danger'.

EXAMINATIONS

It was reported that 47,167 entries had been received for the Whitsun series of Examinations.

EVENING DISCUSSION MEETINGS

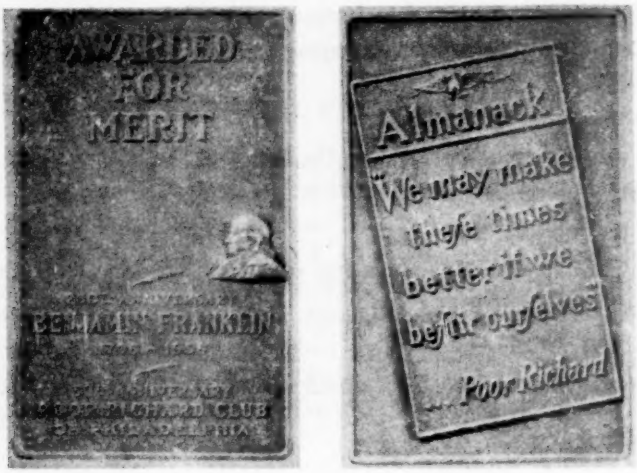
On the advice of the Special Activities Committee, it was decided that the response to the series of Evening Discussion Meetings arranged during the present session did not warrant the arrangement of a similar series next session.

OTHER BUSINESS

A quantity of financial and other business was transacted.

PRESENTATION OF THE POOR RICHARD ALMANACK MEDAL

At an informal ceremony in the Society's House on 15th May, Mr. Kenneth W. Luckhurst, Secretary of the Society, was presented with the Poor Richard Almanack Medal and Diploma 'For Distinguished Service', by Walter D. Fuller, Chairman of the Board of the Curtis Publishing Company of Philadelphia. Dr. R. W. Holland, Chairman of the Council, Mrs. Fuller, Mrs. Luckhurst and the Deputy Secretary were present. The award was made to Mr. Luckhurst by the Poor Richard Club of Philadelphia in recognition of his contributions, and in particular his address to the Club last year, to the celebration of the 250th anniversary of the birth of Benjamin Franklin.



The Poor Richard Almanack Medal, bearing obverse : *the head of Benjamin Franklin ; and* reverse : *a quotation from Poor Richard's Almanack*

Mr. Fuller is himself linked with Benjamin Franklin, both as publisher of the *Saturday Evening Post*, which was founded by Franklin, and as descendant of Anne Franklin, his sister, and after the presentation he and Mrs. Fuller were shown the various letters received by the Society from Benjamin Franklin, and references to him in the Minute books.

RECENT DEVELOPMENTS IN TRADE AND INDUSTRY IN PAKISTAN

The Henry Morley Lecture by

HIS EXCELLENCY MR. MOHAMMED IKRAMULLAH,

High Commissioner for Pakistan, delivered to the Commonwealth Section of the Society on Thursday, 8th March, 1956, with the Right Honble. Lord Hailey, P.C., G.C.S.I., G.C.M.G., G.C.I.E., in the Chair

THE CHAIRMAN: I should begin by a reference to the fact that Mr. Morley, the founder of the Henry Morley lectures, was for nearly sixty years a life Fellow of the Royal Society of Arts. He was Secretary of the Royal Niger Company and it is natural that the lectures which his bequest inaugurated should deal with matters affecting the British Empire and should deal primarily with its economic interests. It is to subjects of this character that His Excellency the High Commissioner will consequently address himself and not to the political issues which now form some source of difference between India and Pakistan. But the economic position of Pakistan is a matter of the greatest concern to all who have had relations in the past with that country or who have a present interest in its welfare.

The following lecture was then delivered:

THE LECTURE

Pakistan is barely eight years old. At the beginning, her economy was mainly agricultural. Raw materials like jute, cotton, wool, tea, hides and skins constituted 99 per cent of her exports; and she had to import almost all the manufactured goods. Industry in the two wings of Pakistan was practically non-existent. Therefore it was but natural for the Government of Pakistan to give the highest priority to the preparation of a development programme so as to give the country a balanced economy.

In the period from 1948 to 1950 a Development Board examined and approved various projects in such fields as agriculture, industry, power, communications, and health on an *ad hoc* basis. During the second half of 1950, however, these projects were integrated into a national development programme known as the Six Year Plan. It was to cover the period from July, 1951, to June, 1957. The basic objectives of this comprehensive plan were (1) a net increase of £60 million sterling in the country's foreign exchange earnings; (2) an increase of £7¼ million per year in Government's revenues; and (3) a thirty per cent rise in the standard of living. The Six Year Development Plan was originally estimated to involve an expenditure of £195 million of which £105 million was internal expenditure; out of the estimated internal expenditure £30 million was to come from private enterprise.

Thirty-two per cent of the total expenditure under the plan was earmarked for the development of agriculture. Projects included irrigation, land settlement, anti-waterlogging measures, improvement in seed varieties, subsidization of chemical fertilizers, purchase of agricultural equipment, improvement of livestock, and development of fisheries.

In order to diversify the essentially agrarian economy, 19 per cent of the total expenditure under the plan was set aside for the development of industry and mining. The plan included the establishment of five jute mills in East Pakistan with a total of 6,000 looms, 24 cotton textile mills of 25,000 spindles each and a paper mill near Chittagong in East Pakistan.

Expenditure on power and fuel was estimated at 18 per cent of the total. Major projects were the Warsak Project in the North-West Frontier, the Mianwali Project in the Punjab, and the Karnafuli Project in East Pakistan. Coal output was to be increased to more than 800,000 tons per year.

Perhaps the most ambitious project in the field of transport and communications was the development of the Port of Chittagong, at a cost of £9½ million. The handling capacity of Chittagong at partition, 600,000 tons per year, has already been increased to 1,800,000 tons per year. The construction of additional jetties was entrusted to a British firm. The goal for 1957 is considerably higher.

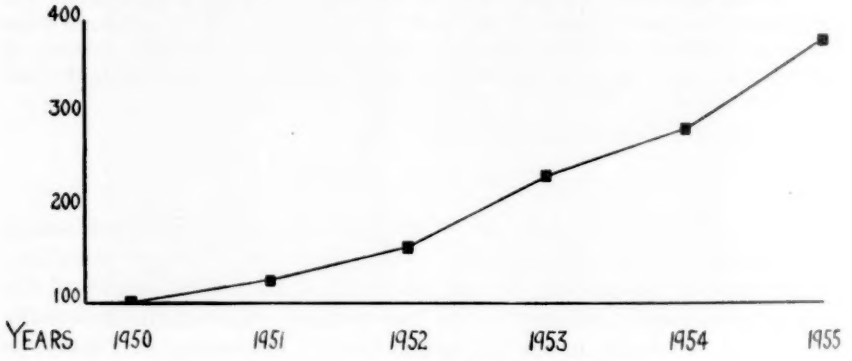


FIGURE 1. *Pakistan index of industrial production. Survey of major industries*

In March, 1951, the Government of Pakistan drew up a special two-year programme designed to give priority to those projects which would make the country self-sufficient in regard to its basic requirements. This step, necessitated by an extreme shortage of capital goods, was taken in the wake of the increase in foreign reserves of the Government resulting from the Korean War boom. Particular attention was given in this programme to the transport and communications industry, and to the development of thermal power to meet the ever-increasing power demand until the full supply became available on completion of long-term hydro-electric projects.

Against this background of development in the fields of agriculture, power and communications, the establishment of industries based on Pakistan's indigenous

raw materials has progressed steadily, and as fast as circumstances have permitted up to the limits suggested by the Development Board. If we take the year 1950 as base year, with the index of industrial production at 100, a rough survey of the production of 17 major industries indicates the corresponding indices at 125 for 1951, 160 for 1952, 235 for 1953, 285 for 1954, and 380 for 1955. The indigenous production of cloth and yarn in 1954 reached 483,000 bales as against 301,000 bales in 1953 and only 108,000 bales in 1950. There has thus been an increase of 347 per cent during the period from 1950 to 1954. The rise in production in the case of other industries during the same period was 130 per cent in sugar, 175 per cent in hydrogenated vegetable oils, 208 per cent in cigarettes, 473 per cent in upper leather, 284 per cent in leather soles, 804 per cent in safety matches,

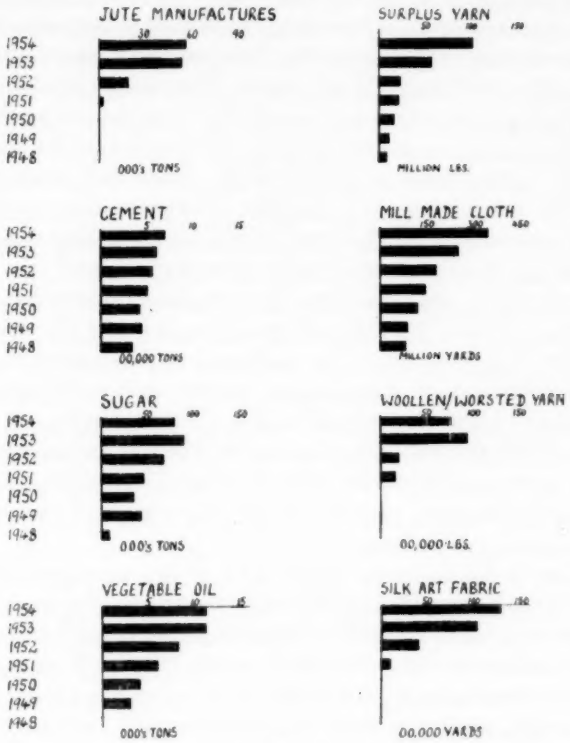


FIGURE 2. *Pakistan industrial production, 1948 to 1954*

52 per cent in crude petroleum, 53 per cent in petroleum products, 63 per cent in cement, 169 per cent in steel ingots and steel re-rolling, 27 per cent in coal and 173 per cent in electric energy. The country is now self-sufficient in coarse and medium varieties of cloth and woollen goods, except worsted fabrics of finer quality. The jute industry, after meeting the country's requirements in full, has already entered the foreign market and 11,000 tons of hessian and

sacking were exported during 1954. The national income originating from large-scale manufacturing industry increased by 34 per cent between the years 1949-50 and 1952-53. The number of manufacturing establishments as defined in the Factories Act increased from 1,800 in 1953 to 2,751 in 1954.

The Government of Pakistan appointed a new Planning Board in 1954 to review the progress which had been achieved so far in order to re-assess the overall resources of the country and to prepare a comprehensive plan of development for the next five years. The new Five Year Plan has been prepared and is under consideration by the Government departments concerned. Meanwhile, the conclusions of the Planning Board, as embodied in their plan, have been taken into account in framing the programme of development in the public sector for 1955-56, which is the first year of the Five Year Plan period.

The most outstanding achievement in the field of industrialization so far has been the manufacture of cotton textiles. The installed capacity already approximates to $1\frac{3}{4}$ million spindles and 25,730 looms. This, as compared with the 177,418 spindles and 4,824 looms which the country had at the time of partition, provides a measure of the progress which has been made in the cotton textile industry. In view of the self-sufficiency attained in the coarse and medium varieties of cloth, attention now is being increasingly devoted to the production of fine and superfine cloth and to the increase of facilities for dyeing and printing.

Nor has the handloom industry been neglected. Supply of yarn to it is being assured in increasing quantities out of indigenous production. At present a fact-finding committee has been set up to inquire into the problems of the industry and to suggest measures for protecting and sustaining it.

At the time of partition, there was no woollen mill in Pakistan. Now eight mills comprising 22,760 woollen and 21,832 worsted spindles are in operation. Two of these mills have been sponsored by the Pakistan Industrial Development Corporation, which has also placed orders for a third mill to be set up at Qaidabad in the Thal area. Adequate capacity for weaving almost all varieties of art silk fabrics has also been established.

The progress of the jute industry has been no less significant. This industry, in which the P.I.D.C. has provided the initiative and a sizeable part of the finance, owes its rapid progress in no small measure to the participation of private enterprise. Private enterprise has contributed nearly two-thirds of the total capital invested so far, amounting approximately to £12·7 million. It has also provided almost the entire managerial and technical personnel required. The target of 6,000 looms was attained by the middle of 1955—much earlier than the date envisaged by the Development Board. The programme for further extension by the addition of 1,500 looms is well under way, and provision for another 1,500 looms is under consideration. The 6,000 looms already installed have a production capacity of 200,000 tons of jute goods per year, valued at £$16\frac{1}{2}$ million. The domestic requirements of the country are only 40,000 tons.

The Karnaphuli Paper Mill in East Pakistan, costing about £$4\frac{1}{2}$ million to build went into partial production in 1953 and is now in full production turning out 30,000 tons of paper worth about £$2\frac{1}{4}$ million per annum. The mill is

now able to meet the requirements of the country for various types of paper other than newsprint. The P.I.D.C. has under examination the question of installing another mill in East Pakistan at a cost of £4½ million and capable of producing 30,000 tons of newsprint per annum. The two board mills at Nowshera and Rahwali, costing £2¼ million, have been completed and are in production. They will produce about 15,000 tons of paper board per annum in the initial stage.

In order to bridge the gap between the supply and demand of cement, two cement factories, one at Daudkhel and the other at Hyderabad, called the Zeal-Pak Cement Factory which started production in January, 1956, have been constructed. The total capacity of these two factories will be 340,000 tons a year. The Daudkhel factory started production in the third quarter of 1955. The Chattak factory in East Pakistan is expected to raise its production from 50,000 tons per year to 75,000 tons per year by the middle of 1956.

In addition to the eight existing factories producing 1½ million fire bricks against the installed capacity of 3·6 million per year, two other factories, one at Malakwal in the Punjab and the other at Landhi near Karachi, are under construction. With their completion, the requirements of the country for most of the refactories will be largely met from indigenous sources.

Investigations have been carried out through the well-known German firm of Krupps—with whom P.I.D.C. entered into a ten-year agreement in 1953 for the setting up of an Iron and Steel Industry in Pakistan. These investigations have established the existence of sufficient quantities of iron ore in the Punjab and in the N.W. Frontier and a scheme for the establishment of an integrated iron and steel plant has been approved. The first phase of the Krupps-P.I.D.C. plan envisages the setting up of a pilot plant at a cost of £7½ million with a production capacity of 50,000 tons of iron ingots. The initial scheme includes two rolling mills with an annual capacity of 115,000 tons of bars, shapes, rods and hoops, and 86,000 tons of sheets and tin plate. Under the second phase of the scheme a plant with the capacity of 300,000 tons of steel ingots and 50,000 tons of pig iron per annum will be installed. The cost of the entire plant is estimated at £19½ million, of which Krupps will subscribe ten per cent and the rest will be contributed by the P.I.D.C.

The two caustic soda plants sponsored by the P.I.D.C., one at Nowshera and the other at Chandragona, having a total capacity of twenty tons per day, have already gone into production. The D.D.T. plant provided by the World Health Organization and the United Nations International Children's Emergency Fund, having a capacity of 700 long-tons of hundred per cent D.D.T. per year, has also been established at Nowshera. In addition to the ten-ton sulphuric acid plant which is under private management in Karachi, two sulphuric acid plants have been sponsored by the P.I.D.C., one at Chandragona and the other at Lyallpur. The Lyallpur plant will convert a large part of its production into super-phosphate and is expected to produce some 6,000 tons of super-phosphate every year. A 50,000-ton ammonium sulphate plant is being established at Daudkhel in the Thal and is likely to commence production by the middle of

1956. The plant, which is estimated to cost £4·7 million, is being financed by the Foreign Operations Administration in respect of the external expenditure involved.

The P.I.D.C. has sponsored schemes for the development of the Karachi Ship Repair Yard, the Karachi Dock Yard and the Khulna Dock Yard. By the time it is completed this year, the Karachi Ship Repair Yard Scheme, which incorporates the commercial dry dock, will have cost £3 million. The main function of the dockyard is to provide repair facilities, but it will also be possible to construct ships of 3,000 dead weight tons. The second phase of the scheme, costing £2¼ million, envisages the building of ships up to 12,000 dead weight tons and is planned to be completed by the middle of 1957. The Khulna dockyard scheme aims at meeting the requirements of inland water transport in East Pakistan, both for repairs and dry-docking. Under this scheme, it is proposed that the Khulna shipyard with its seven slip-ways and the Narayangunj shipyard, which is specially equipped for undertaking repairs to diesel engines, should be dovetailed. The cost of the revised project is estimated at £1½ million.

Although considerable progress has been made in the production of sugar, it has not yet been possible to meet more than a third of the requirements of the country from indigenous sources. Two sugar mills with a total capacity of 24,000 tons per annum have recently gone into production at Jauharabad and Leiah in the Thal area. Two others with a total capacity of 44,000 tons a year, one in Charsadda in the N.W. Frontier and the other in Rangpur in East Pakistan, are expected to go into production by the end of this year.

Arrangements have now been made for the manufacture of metal containers to meet the requirements of processed food industries. Two large-sized modern automatic units for the production of glass containers are also being established. With the availability of containers assured, the processed food industry is expected to make considerable progress. There are now over a hundred factories, engaged in the production of edible oils from locally grown oil seeds like cotton, rape, mustard and sesamum. The production of edible oils is increasing.

Other important industries which have registered progress are matches, machine tools, tanning and leather, paints, varnishes, dyes and pharmaceuticals. There are 14 match factories in the country now, producing 2·4 million gross boxes, as against less than half a million gross boxes of fifty sticks each from eight match factories in 1948. Substantial progress has also been registered in the cigarette making industry. The present production is 5,000 million. It is estimated that within the next two years their annual production will reach the figure of 10,000 million. There are 46 tanneries, some fully and some partially mechanized, with a total annual production capacity of 17 million pounds of soles and 17 million square feet of uppers. The newly established industry manufacturing tyres is now meeting the country's total requirements of cycle tyres and tubes. The P.I.D.C. is sponsoring the establishment of a dyes factory at a cost of £300,000. It is expected to go into production by 1957. The P.I.D.C. has also taken up the development of the pharmaceutical industry, and has re-started the manufacture of santonin. A penicillin plant is being set

up at Nowshera with the assistance of U.N.I.C.E.F. Messrs. Glaxo Laboratories (Pakistan) Ltd. have set up a factory at West Wharf, Karachi, for the manufacture of drugs and antibiotics which started production in January, 1956. A number of other industries, manufacturing consumer goods such as soap, shoe polish, tooth paste, hair oils, cosmetics, pencils, gramophone records, radio sets, sewing machines, and so forth, have made good progress.

In addition to large-scale industries, there is a great scope for the development of cottage and small-scale industries which cover a wide productive field with a broad employment base. These industries are particularly suited for the better utilization of local resources and for the production of a variety of consumer goods for the internal market as well as for export. The Government has established a Small Industries Corporation which will develop overseas and inter-regional trade in cottage industries products. The Government has also decided to establish two Small Industries Development Corporations, one for West Pakistan and the other for East Pakistan, to assess and promote the production and marketing of cottage products within each region. An Industrial Development-*cum*-Research Centre for small industries has been established at Lahore in collaboration with the International Co-operation Administration and a similar centre is being established at Dacca.

The development of power has proceeded satisfactorily. In East Pakistan, the diesel stations at Sidhirganj, Khulna and Chittagong, with a total capacity of 38,000 kilowatts have been completed. Another 30,000 kilowatt steam station at Sidhirganj is being planned. Work is also in progress on the Karnaphuli Hydro-electric Project and, according to the present programme, the first set of 40,000 kilowatts will be commissioned by 1958. In West Pakistan, the Lyallpur diesel station of 10,000 kilowatts capacity is nearing completion and another 6,000 kilowatt set is also being established there. A 132 kilowatt transmission line between Wah and Jhelum with a route length of 116 miles has been completed. The Dargai Project in the N.W. Frontier, with an installed capacity of 20,000 kilowatts, has been commissioned into service. In Karachi, work on the 30,000 kilowatt steam station is nearing completion. The former Sind Government sponsored a project of a 15,000 kilowatt station at Hyderabad. The multi-purpose Warsak Project, which will have an installed capacity of 160,000 kilowatt sets, is expected to be in operation in 1958. The external expenditure on this project is being financed from the aid given by the Canadian Government under the Colombo Plan.

At the time of partition, there was an installed capacity of nearly 61,000 kilowatts of thermal power and 11,000 kilowatts of hydro-electric power. It has now risen to 197,000 kilowatts of thermal power and 63,000 kilowatts of hydro-electric power. With a view to accelerating the development of power resources still further, the Government is considering the question of establishing statutory electricity authorities for the operation of power undertakings on sound commercial lines.

There has been a steady rise in the production of coal which has gone up from 241,000 tons in 1948 to 554,000 tons in 1954. The production of oil has increased

FIGURE 3. *A Bugti flute player and Sui Gas Well No. 2*

from 500,000 barrels in 1948 to 1,800,000 barrels in 1955. Search for more oil in both zones of the country continues. An agreement has been signed with the Standard Vacuum Oil Company providing for a joint venture for oil exploration at a total cost of £15 million, of which 25 per cent will be provided by Government funds. Negotiations are in progress with a number of other oil interests for further exploration of the country's oil resources.

The year 1952 witnessed an event of profound significance for the economy of Pakistan. This event was the discovery of a vast reservoir of natural gas at Sui in Baluchistan by Pakistan Petroleum Ltd.—a British firm. Expert geologists have estimated that this reservoir contains over $2\frac{1}{4}$ million million cubic feet of natural gas which represents a supply of 115 million cubic feet per day for over a century. Work at the Sui gas field was started in 1954 and six wells have already been completed. A re-assessment of the reserves is in progress and, on present indications, it is likely that the total size of the reserves may turn out to be much

greater than the original estimate. The project of bringing gas from Sui to Karachi *via* Sukkur and Hyderabad was completed in September, 1955. The initial rate of production will be 37 million cubic feet a day rising progressively in a few years to three times this quantity. The question of taking the gas north from Sui for the generation of electricity is under consideration. The P.I.D.C. are sponsoring the establishment of a 100,000 kilowatt power station.

Hitherto the industrial and agricultural development of Pakistan was hampered by the meagre supply of indigenous fuel in the country. The estimated total production of coal, all in West Pakistan, is some 600,000 tons per year, whereas the total consumption of coal in West Pakistan alone is about 1,200,000 tons per year. The balance of 600,000 tons has to be met by the import of foreign coal. Similarly, crude oil is produced only in West Pakistan and amounts to 200,000 tons per year. Of this, some 76,000 tons represents furnace oil. The actual consumption of furnace oil in West Pakistan is over 600,000 tons per year, most of which has to be imported from abroad. With the availability of gas in large areas of West Pakistan from this year, for industrial as well as domestic purposes, Pakistan can dispense with large imports of furnace oil, thus saving very substantial amounts of foreign exchange. The gas at Sui is natural gas, which is the most convenient form of fuel nature has provided. It is an ideal fuel for steam power plant installations and is likewise a convenient fuel for internal combustion engines and gas turbines of all sizes. In addition, it is an excellent raw material for the chemical industry and can easily be utilized for manufacturing synthetic fertilizers in order to increase home production of foodstuffs.

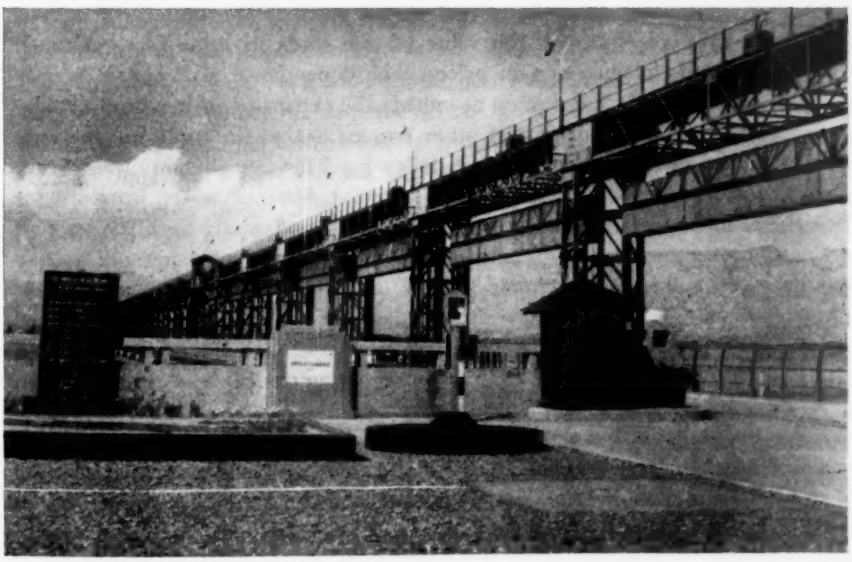


FIGURE 4. *Thal irrigation project; the Jinnah barrage*

The growth of industry in Pakistan, taken together with significant developments in the fields of agriculture, irrigation, communication and power, has had far-reaching effects on the economy of the country. There have been many set-backs and difficulties in the past and there may be some more in the future. The remarkable thing is that, in spite of these difficulties and set-backs, the Government of Pakistan, as well as private investors, has continued to go forward at a speed greater than that envisaged by the most optimistic planners. This progress is illustrated by the fact that in the last five years expenditure in the public sector has been to the tune of £276 million. The annual expenditure on development increased from £31 million in 1951–52 to £83 million in 1955–56. In the private sector over £150 million were invested. The P.I.D.C., which has completed 16 industrial projects with a capital expenditure of £25 million, is expected to complete another 17 projects costing about £30 million in the next financial year. Already Pakistan is regarded as a semi-industrialized country and her economy, which was purely agricultural in 1947, has passed from instability to a position of growing strength.

This change from an agricultural to a semi-industrialized economy is changing the pattern of Pakistan's foreign trade. How far-reaching the effect of industrialization has been on our trade can be gauged from the fact that the import of cotton piece goods dropped from £27·6 million in 1951–52 to a mere trickle at £2·7 million by 1954–55. Similarly, cotton twist and yarn came down from a figure of £19·3 million to only £2·1 million in 1954–55.

The foreign exchange saved as a result of reduced imports of cotton piece goods and yarns has been used for the purchase of much needed machinery and other capital equipment. On the other hand, the volume of our exports in raw materials has, in most cases, been maintained at much the same level as was reached in 1951–52, although the value of this trade in some cases is much lower because of the recession in prices. The dependence of Pakistan, mainly on a few raw materials, has tended to impede the expansion of her export trade. In order to stimulate the export of other articles so that the trade may become as broad-based as possible, the export policy has been considerably liberalized. Government also introduced the Export Incentive Scheme, which provided for the issue of import licences to exporters to the extent of twenty to thirty per cent of the total exchange earned by exporters of selected primary commodities and manufactured goods. This scheme, on the one hand, stimulated the export of minor commodities which had been neglected so far and, on the other, solved the problem of financing the import of certain essential goods. It has also helped to stimulate the development of small-scale industries. It has recently been superseded by the new Export Promotion Scheme which has the same objectives as its predecessor but has a wider scope.

The Government of Pakistan has been conscious of the fact that the stability of the country's economy can best be assured by diversifying her overseas trade, which obviates the risks inherent in dependence on one or two countries. Bilateral trade agreements have, therefore, been concluded with a number of countries. In 1948–49 only four countries, namely the United Kingdom, the

United States, India and China had trade with Pakistan exceeding £7½ million in value. By 1954–55 the number of such countries rose to six, namely, the United Kingdom, the United States, Japan, Germany, India and France. Pakistan's total trade with the world fell from £186·9 million in 1949–50 to £174·4 million during 1954–55. Of this total, India's share fell from £36·4 million in 1949–50 to £15·4 million in 1954–55. With the rest of the world, however, trade increased continuously from £150 million in 1949–50 to £159 million in 1954–55. This increase was due not only to the favourable prices of Pakistan's exports in raw materials but also to an increase in the volume of the country's imports and exports. The total world trade of Pakistan in 1949–50 amounted to £186 million of which exports were valued at £89 million and imports at £97 million. In 1954–55 the total value of trade was about £174 million of which exports stood at £91·7 million and imports at £82·7 million.

The number of Pakistan's major customers in 1948–49 whose imports from Pakistan exceeded £4 million was four, namely the United Kingdom, the United States, Belgium and Germany. In 1953–54 the number of such customers rose to nine, namely the United Kingdom, the United States, Japan, France, Germany, China, Italy, Belgium and Hong Kong. During 1948–49 India was the principal supplier and customer of Pakistan; but her position in Pakistan's foreign trade has been changing continuously and, by 1953–54 her share amounted to only nine per cent.

Pakistan's import policy has always been influenced by her balance of payments position. Up to November, 1952, the import of capital goods and machinery was kept on Open General Licence to facilitate industrialization and other development projects. Thereafter, this policy was abandoned owing to the steep fall in the earnings of foreign exchange caused by the post-Korean slump in commodity prices. Now al imports into Pakistan are licensed, but special consideration is shown to imports of machinery and materials intended for industrialization. The restrictions on imports were, however, relaxed when United States aid was received at the beginning of 1955. With an improvement in the foreign exchange earnings, and progress in industrialization, it should be possible to relax restrictions on imports still further.

Pakistan has received considerable assistance from the United Kingdom, the United States, Canada, Australia, New Zealand and other friendly nations in implementing her development programme. We are very grateful for this timely assistance but we still need assistance and would welcome foreign capital seeking investment. When the Government of Pakistan issued its statement of industrial policy on 2nd April, 1948, it extended this invitation to investors all over the world. Certain conditions were laid down at the time governing the investment of foreign capital. The position has since been reviewed in the light of experience gained in the last eight years and Government has decided to offer the following additional facilities as further incentives to non-Pakistani investors:

(1) Capital invested in industries after 1st September, 1954, in projects approved by the Government of Pakistan, may be repatriated at any time

thereafter to the extent of the original investment to the country from which the investment originated.

(2) Any part of the profits derived from investment and ploughed back into approved industrial projects with the approval of the Government of Pakistan may be treated as investment for the purpose of repatriation.

(3) Appreciation of any capital investment under (1) and (2) above may also be treated as investment for repatriation purposes. In the case of investment by means of goods and services the amount will be the rupee value of such goods or services as recorded in the books of the company or firm concerned at the time of investment.

(4) Such repatriation facilities will be subject to exchange control regulations as are in force from time to time and will not apply:

(*a*) to purchase of shares on the Stock Exchange unless it is an integral part of an approved investment project, and

(*b*) to capital invested in Pakistan before 1st September, 1954.

The Government has also given an undertaking that if an industry has to be nationalized in the interest of the country, just and equitable compensation would be paid to the dispossessed owners and their foreign partners. The compensation received by the foreign investor can be remitted freely to the country of his residence. Participation by foreign capital is permitted up to sixty per cent of the total investment in approved industries. The case of public utility concerns is considered on merit and the percentage of foreign capital that can be invested in them is decided separately in each case.

I believe it will be conceded that these concessions can be regarded as fair, or even generous, by any standards. The Government of Pakistan realizes that, although indigenous capital is not as shy as it was five years ago and the country does get considerable assistance from a number of friendly nations and organizations, the programme undertaken by the Government is so ambitious and of such vital importance to the country's economic well-being that all encouragement should be given to make it worthwhile for foreign investors to take active interest in our development projects. Pakistan has allied herself with the free world. Rapid industrialization can make her strong and an asset to the free world. With her tremendous resources in manpower, occupying the strategic position that she has between the Middle East and the Far East, a strong Pakistan could be a force for good in the cause of peace.

DISCUSSION

SIR HAROLD SHOOBERT, C.I.E., E.D.: His Excellency mentioned the development of sugar. Among the places he mentioned, did he include Mardan or is it known under another name now?

THE LECTURER: The factory at Mardan is already in existence. I mentioned the two other new ones. These are new projects and I did not mention the old ones which are already in production.

SIR HAROLD SHOOBERT: Thank you. I asked the question because the Mardan factory began after Independence was granted.

MISS E. P. QUIGLY: I have recently been reading Dr. Bilgrami's book, *Some Aspects of Education*, in which he advocates that education should now be pursued in Pakistan

on Islamic principles. Would His Excellency be kind enough to say if it is going to be very expensive, from the economic point of view, to change over from the old type of education to education following the precepts of Islam?

THE LECTURER: I think the questioner knows more about the subject than I do, and probably if Dr. Bilgrami has examined this question we certainly would encourage the teaching of Islam in schools. But how can the whole of modern education be changed? For example, in English literature there is nothing Islamic. The point is that the bulk of the modern syllabus of education would have to be continued more or less in the same way. The idea is that as in the past no attention at all was paid to religious education, schools might introduce religious education so that the Muslims may know what their religion is. I do not see how one can make scientific or nuclear education Islamic or non-Islamic.

LIEUT.-COLONEL M. K. DURRAM, G.C.: What facilities do the Pakistan Government propose to give the Foreign Minister as an added stimulus to foreign investment?

THE LECTURER: I read out those four special incentives. If you are a Pakistani investor, you are not entitled to them. Those facilities were meant for the foreign investors.

MR. A. M. NIZAMI: Would it be true to say that the areas in Pakistan have made more progress in the last eight years than during the ninety years of British rule?

THE LECTURER: I do not think it would be quite correct, as Lord Hailey pointed out that when he went as Assistant Commissioner most of the entire area of Pakistan was a howling desert. It was only when the irrigation projects had been completed and people were in a position to settle down and have a decent standard of living that one could think of industrialization.

MR. NIZAMI: I meant industrial progress.

THE LECTURER: Yes, my point is that in each project different things have been done. We were beginning to convert the desert into fertile lands and on the fertile lands now the factories are coming. I should say that probably some more factories could have been established in the area which is now Pakistan but then we were thinking of the continent of India. I am not defending anything, but I worked in the Industries Department and the chief criteria were the advantages available in that particular area for certain industries. The whole of Gondwana, for instance, has got enormous resources, one of the world's largest resources of coal, iron ore, bauxite, copper and everything. Naturally the bulk of the investment went into that area compared with ours. We have a national necessity to develop industries because they are the basis of our living; but at that time Pakistan being a part of India, India as a whole was being developed and certain areas were left behind, I will not say neglected.

MR. SATISH BHATNAGAR: If there were two offers, say from American capital and Russian capital, would there be any distinction made?

THE LECTURER: I think that when we do get that investment we shall decide whether there should be any distinction. No Russian capital has been advanced to Pakistan and none would be. So far as the American capital is concerned the bulk of it is coming in the shape of aid. We draw up a scheme, we discuss it with them and in every case only the foreign expenditure is met by the foreign aid, the rest has to be met by us. All the work that has to be done on a factory, for example, on the buildings, roads, and so on, has to be done by us. It is only the machines which we lack that are provided by the foreign aid. In some cases as much as eighty per cent is our own money.

THE CHAIRMAN: In thanking His Excellency for the address he has given us and the courtesy he has shown in replying to the questions put to him, I should point out that an address dealing with an economic subject and involving the quotation of

a considerable volume of facts and statistics is never a light or easy task. I will only ask the audience to remember that behind all these questions of industrial advance, or the growth of factories, or irrigation, or hydro-electric development there are great human problems. These problems involve in the present case the welfare of some 80 million people, members of the Commonwealth, with whom we ourselves have had close relations in the past and whose future is a matter of great concern to us. The measures to which His Excellency has referred relate to the development, within a comparatively short space of time, of a rural into an industrial, or at all events a semi-industrial, community.

One might almost be inclined to ask whether the attempt which has been made to achieve this result has not been too hurried, and has imposed too great a strain on the energies of a government and a people which have only just taken command of their own destinies.

His Excellency has acknowledged the assistance, both technical and financial, which Pakistan has received from its friends in dealing with the task imposed on it. Everyone hopes that this assistance will be continued for it is greatly needed. Pakistan has approached its problems boldly and with courage. If it is to look for assistance in its task, it will need all the goodwill that its friends can give it. But on its part it must make the one contribution that can ensure the help of its friends—it must endeavour to present to them a picture of stability, of administrative efficiency and of popular contentment. Given these things, there will be no difficulty in securing the material aid of its friends.

A vote of thanks to the Lecturer was carried with acclamation.

THE LECTURER: I would like to say how sincerely grateful I am to Lord Hailey for his remarks. I shall certainly convey them to the people of Pakistan. Lord Hailey has probably forgotten how much respect and admiration the people of the Punjab have for him. I deliberately tried to keep my talk within bounds. I assure you the picture that I have given can be enlarged many times. If I were to dwell on the assistance, educational and technical, we are getting in all fields and particularly from this country (for instance at any given time there are 2,000 Pakistanis studying here) it will show what an amount of interest you are taking in our development programme and what great assistance you are rendering to us. Thank you very much.

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G., M.C. (Chairman, Commonwealth Section Committee): I should like to extend a very sincere welcome first of all to Mrs. van Dulken who is, as you know, the daughter of the great benefactor responsible for establishing this lecture. Then, may I say how pleased we are to see with us once again Sir Harold Shoobert and many other members of the Pakistan Society and also many Pakistanis whom I should like to welcome here.

It falls to my privilege to move a very hearty vote of thanks to our chairman. I think it is common knowledge that Lord Hailey, after spending some forty years, from 1895 to 1934, in the Indian sub-continent, most of which time was spent in what is now Pakistan, undertook the monumental African Survey. I do not think, however, it is quite as well known that, at his present age of 84, he still gets up at 6 a.m. and works every day at Chatham House on the many amendments to that African Survey necessitated by the great constitutional changes which are taking place in Africa at the present time. I may say he goes on working until 7 p.m.! I wonder which one of us, if we are lucky enough to get to his age, would be able to put up such a wonderful record? I mention this because I am sure you will agree with me that we owe him a great debt of gratitude for coming here this afternoon and presiding over His Excellency Mr. Mohammed Ikramullah's most illuminating and comprehensive lecture. Now I am going to ask you to help me thank our chairman, Lord Hailey.

A vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

THE BRITISH GLASSHOUSE INDUSTRY

A paper by

W. F. BEWLEY, C.B.E., D.Sc., V.M.H.,

Director, Glasshouse Crops Research Institute, read to the Society on Wednesday, 22nd February, 1956, with Sir Edward Salisbury, C.B.E., D.Sc., F.R.S., V.M.H., Director, Royal Botanic Gardens, Kew, in the Chair

THE CHAIRMAN: It is my privilege and my pleasure to introduce to you our lecturer this afternoon, Dr. Bewley, who has been Director of the Glasshouse Research Station for I believe now 37 years. You will not believe that he was as old as thirty when he was appointed, we all think of him as much younger than he is. You will realize that when he talks to you, and I am sure we are going to have a very interesting paper.

The following paper was then read:

THE PAPER

In my book *Commercial Glasshouse Crops* which I wrote very largely during World War II, I wrote:

> The glasshouse industry which started about a hundred years ago, has reached an interesting stage in its development. Even now it is the most highly capitalized, the most productive and the most complicated of all the branches of horticulture, but given favourable economic conditions and the same desire to progress as that which imbued its pioneers, it could reach heights of efficiency in scientific crop production which few have ever visualized.

If I believed that in 1950—how much more must I do so now. In the six years that have elapsed, however, since my book was first published there have been serious economic changes and these have influenced the present position; it would be a brave man who ventured to prophesy about the immediate future.

HISTORY

The very beginning of the glasshouse industry depended, as its name implies, upon the discovery of glass which, 500 years ago, was a luxury. At one time, only the very rich could afford to have glass-filled windows in their houses. When they changed homes they took their windows with them and it was in their beautiful gardens that glass was first used to protect valuable plants or, in other words, the idea of a glasshouse was conceived.

At first simple frames were used to cover hot beds, where tender vegetables and cucumbers were grown. Later these frames were leaned up against walls to protect fruit trees from frost. At first these were merely large glazed wooden frames, with the top resting near the top of a wall while the base rested on the

ground four or five feet from the bottom of the wall. At first these were mobile, but gradually more elaborate fixed structures came into being and the earliest glasshouse, the 'lean-to', was born. Of various shapes and sizes, these consisted essentially of a brick wall, some nine feet high on the north side, with a sloping roof of glass from the top of the wall on the north side to a low wall built some seven or eight feet to the south. Glass ends, containing doors, were fitted to complete the job. These structures were used chiefly to protect vines, peaches and nectarines growing on the walls. They were dark in comparison with modern structures, for the glass panes were only five or six inches wide and the wooden bars were substantially thick. Also the roof apex was small because the gardeners feared that if snow lay on the glass it would cause damage.

Later, as gardeners found that snow did not damage their structures, they produced more adventurous designs and built lean-tos with wider bases. The next step was the creation of the three-quarter span, which enabled a longer run of vine to be grown without increasing the height of the wall.

Later still, the modern span greenhouse or glasshouse was invented. At first these were separate structures, with a double roof sloping from a relatively high ridge to two gutters, one on either side. From gutter to ground level, or to the top of a low wall, were glass sides. Glass ends, doors and ventilators completed the house. These units were orientated with the long axis north to south. Later it became the practice to unite several houses in one block, thus achieving cheaper construction by omitting most of the side walls.

Ultimately we arrive at a time, about the middle of the last century, when probably in several parts of the country there arose the idea of commercializing the cultivation of plants in glasshouses. This was probably in the 'forties, for we know that by that time skilled gardeners along the south coast, in the north and west of London, and in the Island of Guernsey, had already learned the art of cultivating plants in the somewhat primitive glasshouses in their masters' gardens. In Worthing the pioneer was a Mr. Head who, in the early 'forties of the last century, built in Anchor Lane two houses each a hundred feet in length They were glazed with small square pieces of glass and were planted with Pope's strawberry vines, the fruit from which was sold in Brighton market. The nursery was gradually extended and ultimately passed to Mr. Thomas Bushby, who was the pioneer grower of tomatoes in Worthing.

In Guernsey grapes were grown in glasshouses about the same time. We are told that many varieties were used, including Black Hamburg, Sweet Water, Muscat of Alexandria and White Syrian. The last of these is said to have produced bunches two feet in length and one and a half feet across the shoulders when it was first introduced. It sounds like an exceptional F1 hybrid. At first all attempts to sell the fruit failed both locally and in Covent Garden. So bad was the trade that the glasshouses were allowed to deteriorate without any attempt being made to repair them. Later, however, the venture was attempted again and in 1856 four tons of grapes were sold in Covent Garden.

Wheadon, in his excellent little book *The History and Cultivation of the Tomato in Guernsey*, la Société Guernesiase, Guernsey, says that one of the first occasions

on which tomatoes were grown under glass in Guernsey for the market was in 1874 by Mr. J. Hodges working for Mr. Nightingale at Mon Plaisir.

Lea Valley area

Commercial glasshouse work in North and West London started in florists' shops like those of Messrs. Bull, Cutbush, Weekes and Veitch, who had show-houses and supplied gentlemen's gardens with plants, seeds and sundries. There is a nice little story also about a bookbinder, Charles Wood by name, who sometime between 1840 and 1850 noticed the drabness of his shop and attempted to brighten it with flowers from his garden, which he displayed in his window. So many people attracted by the flowers asked to buy them that he saw the possibilities of a florist's shop and gradually developed into a grower and incidentally a seller of flowers.

Other gardeners, destined to play an important part in the Lea Valley area, built nurseries at Finchley, Edmonton and Tottenham. They include such names as C. H. Shoults, John Kay, James Sweet, H. B. May, and George Beckwith. At Page Green, a Yorkshireman, Mr. J. Rochford, built a considerable area of glasshouses for cultivating bedding stuff and plants in pots. About 1880 the nurserymen in North London seemed to become restless, because shortly afterwards we find them seeking new homes in the valley of Lea.

In 1882 Mr. Joseph Rochford, whose family were later to become famous in the glasshouse industry, started to build a nursery at Marsh Lane, Turnford, and his brother Thomas followed soon after. About the same time Robert Hamilton built Providence Nursery at Waltham Cross. Later, in 1887, Mr. Joseph Rochford built his famous Jubilee House extending over a quarter of an acre of land, and grew first tomatoes and then grapes. It is probable that this was the first crop of tomatoes in the Lea Valley.

After the year 1890 growers began to settle in Cheshunt and nurseries began to go up all around the district. In the Flamstead End area the name of Stevens soon became famous for high-class roses, and remains so to-day. To Cheshunt went C. H. Shoults, to Waltham Cross went H. O. Larsen, J. Nielsen, W. B. Randall and R. Cobley. To Hoddesdon went R. L. Glasspool, J. Harnett and W. Dyke. Important improvements in glasshouse heating arose in the Lea Valley. Mr. Joseph Rochford designed the Rochford type of tubular boiler and also initiated the standard method of building glasshouses in blocks instead of single as before. The rate at which the industry grew was a little astounding and, although it is not easy to get authentic figures for the whole industry, those provided by the late Mr. C. W. Cook, rating and valuation officer of Cheshunt, are interesting.

Area of glass in the parish of Cheshunt

Year	*Acres covered*
1900	264
1910	345
1914	429
1920	435
1929	667

To-day the Lea Valley area in Middlesex, Essex and Hertfordshire probably covers some 1,400 acres.

Other areas

While the above-named areas are the most important in England, there are others in the Thames Valley, North-West Kent, Blackpool, Hampshire, Norfolk, Staffordshire and Lancashire.

Scotland

In Scotland most of the glasshouse industry is devoted mainly to tomatoes, although bulbs and some flowers like the chrysanthemum are grown. It is located chiefly in the Clyde Valley with more recent developments around Edinburgh. The most famous parishes are Carluke, Lanark and Lesmahagow, which are all on the fringe of the great industrial area of Lanarkshire within 25 miles of Glasgow.

Wales

In Wales glasshouse nurseries are found in the north and also the south but there is no sign of any large areas developing.

Northern Ireland

In Northern Ireland glasshouse cultivation is of relatively recent introduction with the exception of a few nurseries built between the wars.

Future tendencies

The general trend of development is away from industrial areas towards the sunnier parts of the country. This is inevitable, because costs of production are rising so fast that the heaviest and most valuable crops will soon be the only ones that will pay.

THE DEVELOPMENT OF THE GLASSHOUSE INDUSTRY

(*a*) *Before World War I*

Because the glasshouse industry started with the cultivation of grapes, pot plants and bedding plants, the original houses were designed to suit these crops. Many of them were low, narrow structures with strong roof bars and rafters placed fairly close together and glazed with small panes of glass. As glass became stronger and growers had more experience of what it would stand, they used thinner bars and panes of glass up to 18 inches by 20 inches. Also houses became wider and were constructed in larger blocks. In the Lea Valley the so-called 'aeroplane' house came into being. The previous vinery type houses had been 28 to 30 feet wide, with gutters averaging 5 feet 6 inches and the ridge 12 feet 9 inches high. The new 'aeroplane' type had a width of 14 to 15 feet, with gutters 6 to 7 feet high, the ridge remaining 12 feet 9 inches. The high gutters allowed the back row of tomatoes more room than they had in the earlier houses and so increased the crop. As the industry progressed, pot plants and bedding stuff gave place to tomatoes, cucumbers, roses and carnations. Grapes, peaches and

nectarines were still grown by specialists, while chrysanthemums and mushrooms were grown in autumn and winter. Some pot plants and bulbs for forcing were also grown.

Although a proportion of the glasshouses in this country are not heated artificially, they form a section of their own and when referring to the glasshouse industry most of us think in terms of heated houses. The earliest houses were heated by means of a hot brick flue which passed along the centre of the house from one end where the boiler was situated, to the other at which the chimney was placed. These flues gave off a good deal of heat, but they often leaked and gases entered the house with results detrimental to the crops.

Central flues soon gave place to hot-water pipes in which hot water circulated by what was known as the 'gravity system', the power being the difference in weight of two columns of water—one being hot, the other cooler. Through the period before World War I the design of the boiler and the arrangement of the pipes were continually improving, but heating was still of an elementary type.

This first period of building up the industry, therefore, was one of individual development by pioneer growers who, having encountered and overcome many difficulties, had created for themselves successful businesses and showed little desire to co-operate with one another. This state of affairs could not last for ever, and indeed events occurred presently which compelled some growers at least to co-operate with their neighbours.

(*b*) *Between the two wars*

Development during this period was rapid; the building of nurseries went on without ceasing. The tomato went on from strength to strength, but the cultivation of the cucumber gradually decreased, both in the Lea Valley and the Worthing areas, very largely owing to several years of low prices. There was an increase in the acreage of roses and carnations, especially the latter. The cultivation of mushrooms as an autumn and winter crop in glasshouses increased considerably and the American type of mushroom house attracted more and more attention. Crops like grapes, peaches, nectarines and figs were grown less and less except along the south coast. The raising of Cheshunt Early Giant and Cheshunt 5B lettuces at the Cheshunt Research Station increased the cultivation of winter lettuce very considerably, and indeed started what was practically a new crop in glasshouses.

This period saw improvements in house construction in providing lighter and more airy houses. One or two growers on the south coast tried 24 inch by 24 inch glass with good results.

Messrs. Glasspool and Harnett were the first to circulate the hot water in their heating systems artificially. They injected steam from their steam sterilizing boiler into their hot-water pipes, thus raising the temperature of the water and circulating it rapidly during cold weather. This principle was later embodied in what came to be known as the steam-*cum*-water system, in which water in the heating pipes was heated solely, and also circulated, by means of special

injectors which introduced into them steam produced in large steam boilers. For a time this method was very popular, but even when it became less so it left in the minds of growers the lesson that the heating of their houses could be improved by circulating the water in the heating pipes. One result was the extended use of electric pump circulation. Up to this time a four-inch pipe was the standard type used for heating, but growers were beginning to examine the possibility of using a greater number of smaller pipes with the object of securing more uniform temperatures. The late Carl Englemann, carnation grower of Saffron Walden, installed a heating system using live steam in narrow pipes. In his large airy houses the system was highly successful.

A few years before the outbreak of World War I, growers were becoming more kindly disposed towards the suggestion of co-operation, with the result that growers' associations were formed in the Lea Valley (1911), Worthing (1912), North-West Kent, and so on. These were all quite separate organizations but they declared one object—co-operation between growers for the ultimate good of the industry. The outbreak of war in 1914 strengthened these bodies and at once proved their value because they provided means whereby growers could consult together in the national emergency.

After the war, difficulties in obtaining nursery supplies caused the Lea Valley Growers Association to form another company known as Nursery Trades Ltd., in 1920. About the same time they started a grading and packing scheme for tomatoes and cucumbers which became the basis of that sponsored by the National Mark. Then in 1922 the Lea Valley Growers were largely responsible for the formation of the British Glasshouse Produce Marketing Association, designed to advertise home-grown glasshouse produce. The services of advertising specialists were engaged at considerable cost covered by a levy on every package marketed by the members. The scheme was voluntary and, while it was supported by a great many growers, others refused to participate and although it survived for 15 years it was ultimately wound up. It was worthy of a better fate. The urge for national unity was about, however, and by 1927 most of the growers' associations (of which by this time there were many all over the country) had joined voluntarily with the National Farmers' Union. In 1932 the Worthing growers formed the Worthing and District Growers Ltd., to improve the transportation of produce from West Sussex to markets all over the country. In 1940 the Lea Valley Growers Transport Ltd., was formed for similar purposes.

In 1913 the Lea Valley Growers embarked upon a new type of adventure, by setting up the Experimental and Research Station at Cheshunt. It was indeed the first attempt of its kind in the country, because it was created by the growers themselves, who had learned to appreciate the benefits of scientific research, to employ scientific methods to solve certain problems affecting their industry: chief of these were the tomato moth caterpillar and 'soil sickness'. In this they had the support of the Ministry of Agriculture who added another £1 to every £1 subscribed by the growers.

When, after service with the Gunners, I joined the staff of this station in 1919 conditions were anything but encouraging. Funds were so low that the improviza-

tions we had to make would earn the scorn of any modern graduate. Refusal to accept defeat won in the end, but only when it was realized that if the scientists working at Cheshunt were capable of providing practical solutions to the growers' problems, they would in time gain their confidence and so build up a research organization worthy of the industry. The policy laid down was to direct research in such a manner that the results could be applied in a practical way to large-scale commercial work. This policy proved to be the right one, for the station ultimately earned a popularity that spread to every part of the British Isles and also overseas. In 1921, at the request of the Ministry of Agriculture, it became the National Station for all crops grown under glass.

Looking back to the end of World War I, it is easy to see the influence of scientific research upon the progress of the industry. Tomato crops are heavier and cleaner, and methods for producing better quality fruit have been devised. Improved varieties and those resistant to leaf mould are available. Winter lettuce in glasshouses has become an important crop through the raising of Cheshunt Early Giant and Cheshunt 5B at the Cheshunt Station.

The evil effects of virus diseases have been reduced by the use of virus-free tomato and cucumber seeds. It should not be forgotten that it was the growers themselves who started the Market Growers Seed Association Ltd. in 1939, for the purpose of growing and distributing virus-free seeds. A small modern nursery in Sussex now sells seeds from virus-free plants to its shareholders who have proved, beyond doubt, the benefits that accrue.

(*c*) *During World War II*

The glasshouse industry played a part in feeding the nation during the war in a way of which every member can be justly proud. Despite the glorious work of the Navy and Merchant Navy this country was likely to be short of such health-giving foods as oranges, lemons and grapefruit—the tomato was the one fruit to take their place. As soon as the war started, 'cropping orders' were imposed instructing growers to devote every possible square foot to the cultivation of tomatoes. Those who held valuable stocks of other crops including flowers were compelled to reduce the scale of production to ten per cent of what it was before the war. This dispensation was made in order that valuable stocks should be preserved for the time when peace returned. Growers accepted these changes with good grace, and it is to their undying credit that despite shortage of labour and all kinds of difficulties they so increased the total output of tomatoes that with the aid of an outdoor crop the total fruit in 1942 made up the deficiencies occasioned by the loss of the Netherlands and the Channel Islands.

(*d*) *Since World War II*

What is the state of the industry to-day? Thanks to the kindness of H. W. Durrant, of the Horticultural Price Statistics Branch of the Ministry, I am able to quote certain figures from the 4th July returns for 1955. These given below show very clearly the total areas of crops in January and July, 1954, and 1955:

(*a*) ACREAGE OF CROPS IN GLASSHOUSES

Crops	*July*	
	1954	1955
Tomatoes (heated)	3092	2431
Tomatoes (unheated)		569
Cucumbers	480	455
Lettuce	—	—
French beans	—	—
Mushrooms	—	—
Other vegetables and herbs	33	28
Grapes	32	26
Peaches and nectarines	18	17
Other fruits	5	4
Carnations	182	191
Roses	106	115
Orchids	10	10
All other flowers and foliage crops	344	366

(*b*) PRECEDING JANUARY RETURNS

Crops	1954	1955
Lettuce	520	505
French beans	3	3
Mushrooms	38	32
Other vegetables and herbs	62	65
All other flowers and foliage crops	592	647

On 4th July, 1955, glasshouses on nurseries possessing more than 1,000 feet of glass totalled 3,851 acres of heated glass and 763 acres of unheated glass.

The tomato is always the most widely grown crop, with cucumbers second and unclassified flowers third, carnations and roses coming fourth and fifth respectively.

In winter, as shown by the 15th January returns, there were some 505 acres of lettuce and again a large quantity of unclassified flowers and foliage.

Growers of glasshouse crops are in a peculiar position to-day. They face production costs many times greater than in 1939 and, although the value of their produce has also increased it is not sufficient to meet rising costs. Indeed, the glasshouse industry is probably the only one where costs of production are rising while the value of its products are falling.

Statistics published by the Tomato and Cucumber Marketing Board in their *Journal* for December, 1955, provide ample confirmation of this fact, as their table reproduced below will show. The rise in wholesale prices for tomatoes during the past four years has been much less than increases in the average price of all articles and goods sold. During 1955 the wholesale price for tomatoes was three times the pre-war figure, but the chief items in the growers' costs—coal and wages—are nearly five times and four times this figure respectively.

PRICE AND WAGE INDICES

Year	*Average wholesale price for English tomatoes (May-November)*	*Wholesale price of all articles and goods*	*Price of coal*	*Agricultural workers. Minimum rates of wages based on hours worked*
1930/8	100	100	100	100
1940 ...	203	n.k.	140	142
1945 ...	157	n.k.	237	219
1950 ...	232	n.k.	304	311
1951 ...	285	n.k.	340	338
1952 ...	274	323	380	357
1953 ...	265	324	406	376
1954 ...	301	325	423	394
1955*...	294	330	433 (1st half) 492 (2nd half)	394

* All 1955 figures are provisional. n.k.—not known.

Unless this lack of balance can be adjusted the future for many is black.

Can we take hope from what has happened in the past?

(*a*) The industry has throughout its history continually faced innumerable difficulties—all of which it has overcome. The organized brains of the industry with the Ministry of Agriculture and Fisheries, and the Government, can work out its salvation again.

(*b*) Scientific research has, in the past, controlled pests like the tomato moth caterpillar; white fly; red spider mite; thrips; wireworms, and so on; diseases like damping off and foot rot; Verticillium wilt; Didymella stem rot; Botrytis stem rot; leaf mould of tomato, and so on. It has also solved problems such as soil sickness; mineral deficiency disorders; fruit discolouration disorders, and soil sterilization. It can be relied upon to do what is necessary, provided it keeps the practical application ever before it.

Now the industry is better provided with scientific assistance than ever before. It has its own new 'Glasshouse Crops Research Institute' at Littlehampton for fundamental research, which has now taken the place of the Cheshunt Research Station closed down in 1955; several experimental stations of the

National Agricultural Advisory Service, and a number of specialist research institutes and university departments interested in its problems.

In February, 1951, the Tomato and Cucumber Marketing Board came into being. It is essentially an organization administered by the growers themselves for the benefit of the whole industry. It has the thankless task of trying to please everyone and it would be surprising if it succeeded in doing so. Its attempts to maintain prices, and improve quality, grading and marketing have already indicated what it could do if every grower gave it wholehearted support.

DISCUSSION

MR. A. A. POLLARD: Can the lecturer tell us whether any work is being done on virus diseases at the present time?

THE LECTURER: We started virus work many years ago and I think that we did good work when we showed that virus diseases of the tomato are transmitted in the seed. We also confirmed what other people had found before, that virus diseases of the tomato are transmitted from smoking tobacco. We think that the grower has in his own hands the control of virus diseases of the tomato.

So far as the cucumber is concerned, the virus diseases of the cucumber which were common years ago are very seldom seen to-day, because virus diseases of the cucumber are also carried in cucumber seed. Now we insist upon seeds taken from clean plants, so there is little cucumber virus to-day. This virus is not readily carried from other plants to commercial cucumber crops.

There are certain virus diseases that are very, very serious, however. One of them is the flower distortion virus of the chrysanthemum. We first met that one just before the war and after the war I issued a warning in very definite terms, pointing out how serious this virus disease of the chrysanthemum would become if steps were not taken to control it. Very few people took any notice of it, and the result is that we still have chrysanthemum virus in the country. Mr. Pollard is a grower of carnations, however, and possibly it is this plant which interests him.

Now virus diseases in the carnation are very serious and I believe Dr. Kassanis, a member of the staff of Rothamsted Experimental Station, has voiced the opinion that there is not a single carnation plant in this country that is free from virus. If that is true, and there is no reason for doubt, then either virus diseases of the carnation just do not matter or else we must do something about them. So far as mild carnation virus in the country is concerned growers have learnt how to cultivate carnations so well that apparently they thrive although they are infected with this virus. Personally, I consider this is a dangerous situation and I hope someone will try to establish a centre at which virus-free carnations and virus-free chrysanthemums can be grown and distributed. I think this is a job for a scientist and not a grower, or perhaps the two combined. So there is chance for the new generation of scientists to do something about this most important problem.

The work of our virologist, Dr. Howles, which incidentally I started myself at Cheshunt, is being continued steadily at Littlehampton. Recently he has been examining the effect of certain growth-promoting substances on many different viruses.

MR. S. L. LORD: Could Dr. Bewley give us any tips about wilt in carnations?

THE LECTURER: There are several wilt diseases of the carnation. The original fungus wilts of carnation were caused either by Fusarium or else Verticillium. Good measures of controlling these have been worked out. We have proved on many nurseries that it is possible to achieve freedom from these by the simple process of maintaining special houses in which stock plants are grown in pots, for the

special purpose of providing cuttings for propagating new plants. By this means any diseased plant can be destroyed before the disease spreads to neighbouring plants, as would certainly happen if the stock plants were being grown directly in the ground. The lesson from all our experience with these diseases is therefore to maintain stock plants in pots.

There are, of course, two new wilt diseases of the carnation of which we have little experience in this country. They are bacterial wilt diseases. Our knowledge of the first of these diseases comes from Denmark and we have not found very much of it in this country. It is caused by *Pseudomonas Caryophylli*. The second of these bacterial diseases was discovered recently in this country. It seems to be more dangerous than the first, and growers would be well advised to report any cases of wilt they may encounter to the Advisory Officer of their county. Uncontrolled distribution could be a serious matter.

MR. S. G. NORRINGTON: Could the lecturer tell us the weight and quality of the glass used?

THE LECTURER: We use mainly twenty-ounce horticultural glass supplied by one of the well-known manufacturers. At Cheshunt we tested one of the ultra-violet transmitting types of glass many years ago. The makers gave me sufficient glass with which to glaze half a cucumber house. We grew cucumbers under standard conditions in that house for a number of years. There was an appreciable increase in crop under the special glass at first. After about six years, however, the glass seemed to have lost its power to transmit the short rays, because the difference in yield under the different types of glass was not maintained.

Normally the size of our glass sheets is 18 inches by 20 inches, but recently there has been a tendency to use larger sheets. When building our new houses at Littlehampton we have used sheets 24 inches by 24 inches with excellent results and apparently no increase in the percentage of breakage during the winter.

MR. D. NEVILLE-JONES: Does the lecturer think any practical interest attaches to the efforts that have been made in Germany to increase production of glasshouses by putting up the concentration of carbon dioxide (CO_2)?

THE LECTURER: Some years ago we investigated this problem at Cheshunt. We came to the conclusion that, although crop increases up to thirty per cent could be induced by raising the concentration of carbon dioxide in the air of glasshouses, we could not secure full advantage of the process because the intensity of our light was too low. It is possible that better results could be obtained in the Channel Islands where light conditions are so much better. Furthermore, the methods for generating the gas did not prove economic.

THE CHAIRMAN: I am sure you would not like to disperse without expressing to Dr. Bewley our deep indebtedness to him for the most interesting account he has given us of the development of the glasshouse industry.

I could not help thinking, when I heard him describe those early phases, how history repeats itself. He referred to the way in which glasshouses began by somebody propping up a pane of glass over a plant. The same thing has happened in alpine gardening, in the rock garden; it started with a pane of glass and now it has got to the little miniature greenhouse, the *cloche*. But if one peruses the early reports of the successive years of the Cheshunt Research Station one of the things that impresses one is that most of the papers put out during the first decade were produced by Dr. Bewley himself, dealing mostly with diseases of the tomato. Even if he was not able, because of his other duties, to be quite so prolific in later years, one realizes from the numerous papers that came out how actively research was pursued in that institution.

I would like to stress the complexity of the problems which face the investigation of any growing industry of that sort. Whether in the field of horticulture or the field

of agriculture one is dealing with a whole complex of phenomena, in fact, as an ecologist I like to think of agriculture and horticulture as applied ecology and I do not think anybody would take exception to that. The point of the ecological approach is not that it is a new subject, although it is a new name, but that it represents an integration of the contributions from many subjects. That I think is the aspect one has to bear in mind in connection with an industry such as the glasshouse industry—the way in which the contributions from a number of specialities are brought to bear on the problem. For example, Dr. Bewley has referred to that excellent work which was done at Rothamsted on soil sterilization. Now in fairness, in that connection, one ought to refer to the name of Dr. Hutchinson because I think Sir John Russell would be the first to admit that Hutchinson's share in that work on soil sterilization was as great as, and perhaps even greater than, his own. Also one should refer to the name of Dr. Cutler. Dr. Cutler was the protozoologist on the staff of Rothamsted at that time and Dr. Hutchinson was the bacteriologist. There the combined expert knowledge of a protozoologist, a bacteriologist and a soil chemist were concentrated on that one problem. So too in the pursuit of these problems at Cheshunt we have the combination of the work of plant pathologists, entomologists, soil physicists and so forth. That represents at once the difficulty of solving these problems and the interest of their solution.

One of the great problems that faces us to-day is the deployment of our relatively limited scientific manpower to the best advantage. Consequently, with the numerous problems that open up as our knowledge advances, we have to consider this important point—not merely what practical difficulties are to be solved by attacking any particular problem, but how far the attack on that problem will also add to fundamental knowledge, so that the answer to the problems of to-day may help us to answer the problems of to-morrow.

During his years at Cheshunt, Dr. Bewley has become the guide, comforter and friend of the glasshouse industry. It is a salutary maxim that people who live in glass houses should not throw stones, but Dr. Bewley has never hesitated to throw stones at outworn shibboliths or at outmoded practice and perhaps more than anything else Cheshunt is an example of combination both of theory and practice.

Cheshunt has gone and its place is taken by Littlehampton and very soon Dr. Bewley will be retiring, but if the glasshouse research has moved into a second phase that has only been possible by the pioneer work which Dr. Bewley carried out. His services to the State were recognized by his creation as a C.B.E. His services were recognized in the horticultural field by the Royal Horticultural Society, by the award of the Victoria Medal of Honour, the highest award which the Royal Horticultural Society has in its power to offer. But you I am sure would wish here to express not only your appreciation for the interesting paper that he has read, but also at the same time your appreciation of the services which he has rendered to the glasshouse industry.

A vote of thanks to the Lecturer was carried with acclamation.

SIR JOHN SIMONSEN (A Member of Council of the Society): I am sure after this most excellent paper you would wish to express your appreciation of the kindness of Sir Edward Salisbury in presiding to-day. In more congenial circumstances, external circumstances I mean, all of you have visited Kew and enjoyed the beauties of those gardens, but I wonder how many fully realize that it is the greatest source of botanical research not only in this country, but probably in the world. It is indeed fortunate that we have had for so many years Sir Edward directing its activities. We are therefore especially grateful to him for coming here to preside over this meeting, since after all he also lives with glasshouses as does the glasshouse industry.

A vote of thanks to the Chairman was carried with acclamation, and the meeting then ended.

GENERAL NOTES

THE PERKIN CENTENARY

In the Easter vacation of 1856 an eighteen year-old student of the Royal College of Chemistry, William Henry Perkin, working at home, attempted to synthesize quinine, using the coal-tar derivative aniline as a base. The result was a black powder which, when dissolved in alcohol, produced a brilliant mauve liquid. Further experiment showed Perkin that this aniline product was in fact a dye, later to be named mauveine. Realizing the significance of this, Perkin in August took out a patent for the discovery; by October he had already determined to manufacture the dye and, a lad of 18, had persuaded his father to put all his savings into the invention. By the end of the following year his own factory was built and in operation, and this at a time when organic chemistry was in its infancy. The significance of these achievements, which are being widely celebrated this month, is best summed up in the citation for the award to Perkin of the Albert Medal of the Society of Arts 34 years later: 'for his discovery of the method of obtaining colouring matter from coal-tar, a discovery which led to the establishment of a new and important industry, and to the utilization of large quantities of a previously worthless material'.

Perkin had, in fact, set in train the marriage of chemistry with industry in setting up a factory for the commercial exploitation of his process. It was the first factory in the world for the industrial manufacture of an organic chemical. Not only this, it began the emancipation of the British textile industry from that reliance upon the natural dyestuffs which was seriously hindering its further development.

The Society had always been deeply concerned to improve the country's supply of the natural dyestuffs, and Perkin's discovery was therefore of considerable interest to it. In 1868 he delivered a course of Cantor Lectures to the Society, on 'The aniline or coal-tar colours'. In the following year he made a further advance in this field by producing, simultaneously with two German scientists, artificial alizarin, the base of the red dyes. This had previously been obtainable only from madder, for the cultivation of which in this country the Society had offered premiums almost annually from 1754 to 1775. In 1879 Perkin again addressed the Society, delivering two lectures on 'The history of alizarin and allied colouring matters and their production from coal-tar'. In 1890 as already mentioned, he was awarded the Albert Medal, which was presented to him in the following year by the Prince of Wales, then President of the Society.

The Coal-tar Colour Works, Greenfor Green, in 1858.
Reproduced from the Journal for 30th May, 1879

The celebrations this month, under the patronage of His Royal Highness The Duke of Edinburgh, and sponsored by the Royal Society and a group of five specialist Societies, have taken the form of a Conference and social functions, supplemented by an excellent exhibition at the Science Museum. On the evening of 7th May, the principal overseas guests were entertained at the Tallow Chandlers' Hall by representatives of the Councils of the sponsoring bodies. On Tuesday, 8th May, the opening paper of the Conference, on the 'Life and work of Perkin' was read by Professor John Reed, and in the evening a reception for all conference members, and guests, was held at the Guildhall. On 9th May papers on 'The rise of the British Dyestuffs Industry', and 'The application of the British Dyestuffs Industry', were read by Clifford Paine and J. L. Evans, respectively and the final paper, on 'The development of Organic Chemistry since Perkin's discovery', was read by Sir Alexander Todd on Thursday, 10th May, followed in the evening by a banquet at the Dorchester Hotel.

The Perkin Exhibition at the Science Museum, at present intended to remain open until 8th June, starts with a series of *tableaux* depicting the use of dyes from ancient Egypt to the present, and proceeds to demonstrate chronologically the discovery and development of the chemical dyestuffs industry. Several of Perkin's notebooks are shown, together with samples of fabrics dyed by him in the early days. There are also cases containing models of dyestuffs works, and others showing materials dyed with the latest colours, loaned by firms who are members of the British Colour Council. The continuous research and experiment which have taken place in order that Perkin's first discovery might lead to the modern range of fast chemical dyes, and to a British Standard of Colour, are amply demonstrated.

The Exhibition is open from 10 a.m. to 6 p.m. on week days and from 2.30 p.m. to 6 p.m. on Sundays. Admission is free.

GRENADIER GUARDS EXHIBITION

The history of the Grenadier Guards in the 300 years which have elapsed since the Regiment was founded by Charles II, then in exile in Bruges, is to be illustrated by a tercentenary Exhibition which is to be held, by gracious permission of Her Majesty The Queen, at St. James's Palace from 30th May to 23rd June. Among the exhibits will be a number loaned by Her Majesty The Queen from the Royal Collection.

The Exhibition will be open from 11 a.m. to 7 p.m. on weekdays, and from 2 p.m. to 7 p.m. on Sundays.

DESIGN IN COTTON EXHIBITION

The first in a series of special displays at the Design Centre opens to the public at 3 p.m. on Monday, 4th June. The Exhibition will be devoted mainly to cotton dress and furnishing fabrics, both woven and printed. This display is additional to the permanent but changing exhibition of durable consumer goods.

The Design Centre, 28 Haymarket, London, S.W.1, is open to the public on weekdays, including Saturdays, from 9.30 a.m. to 5.30 p.m. Admission is free.

CITY AND GUILDS BROADSHEET

The City and Guilds of London Institute has instituted a Broadsheet, the first two numbers of which have already appeared, and which it is intended to issue in February, April, June, October and December of each year. The Broadsheet is to report on a selection of the Institute's activities, which are concerned with the promotion of technical and technological education. The wide scale of the Institute's work as the partner of industry in this field is demonstrated by the fact that there are annually over 100,000 candidates for its examinations in the whole field of technology.

SANDERSON BURSARIES

An exhibition of flower studies by students who have been awarded a Harold W. Sanderson Art in Industry bursary is at present on view at the Imperial Institute, where it will remain until 3rd June. The Exhibition is open on Mondays to Fridays from 10 a.m. to 4.30 p.m.; on Saturdays from 10 a.m. to 5 p.m.; and from 2.30 to 6 p.m. on Sundays.

The Bursaries are open to students aged from 15 to 23, and those who are successful receive a five-year training, working in a studio at the Perivale works of Messrs. Sanderson and making conducted visits to art galleries, and abroad. Full particulars of the scheme are obtainable from the Secretary, The Harold W. Sanderson Art in Industry Fund, Messrs. A. Sanderson & Sons, Perivale, Greenford, Middlesex.

OBITUARY

SIR DAVID RUSSELL

We record with regret the death, at Leven, Fife, on 12th May, of Sir David Russell, a former Assessor to the Chancellor of St. Andrews University.

David Russell, LL.D., F.R.S.E., F.S.A., F.L.S., F.S.A.(Scot.), J.P., was born in 1872, and educated at Clifton Bank, St. Andrews, and at the University of Edinburgh. He then entered the papermaking firm of Tullis, Russell & Co. Ltd., of which he became managing director. For many years he was associated with St. Andrews University, of which he was a Doctor of Laws. He was from 1938 to 1955 the Chancellor's Assessor on the University Court.

Sir David was a member of several learned Societies, and was also a trustee of the Walker Trust and vice-president of the National Trust for Scotland. In 1920 he edited jointly with the Very Rev. Professor W. P. Paterson *The Power of Prayer*, and in 1947 edited a work on *The Great Palace of the Byzantine Emperors*. He was knighted in 1946.

He was elected a Life Fellow of the Society in 1923.

DR. S. WHITEHEAD

We record with regret the death, on 5th May, 1956, of Dr. Stanley Whitehead.

Stanley Whitehead, M.A., D.Sc., M.I.E.E., F.Inst.P., was born in 1902, and educated at Jesus College, Oxford and Queen Mary College, London, of which he was later elected an Honorary Fellow. He joined the British Electrical and Allied Industries Research Association in 1925 as a technical assistant; during the last war he played a leading part in the E.R.A.'s work on bomb and mine locators, and in 1946 was appointed Director of the Association. He was a Manager of the Royal Institution and among his many other positions were the Honorary Treasurership of the Institute of Physics and an Honorary Secretaryship of the Parliamentary and Scientific Committee; he was a member of the Board of Studies in Electrical Engineering, London University, a member and past Chairman of the International Special Committee on Radio Interference, and Chairman of the I.E.C. Sub-Committee on High Voltage Measurement. He had written works on the *Dielectric Breakdown of Solids* and on *Dielectric Phenomena*, and had delivered many papers for scientific and technical bodies.

Dr. Whitehead was elected a Fellow of the Society in 1947.

NOTES ON BOOKS

BRISTOL CREAM. *By Godfrey Harrison. London, Batsford, 1956. 18s*

The centuries of unbroken prosperity which Bristol has been privileged to enjoy rested originally upon the export of wool and the import of wine: wool has long since ceased to be exported from any English port, but Bristol still imports and

re-exports wine as of old. Bristol is described in *Gesta Stephani* as 'the most opulent city in all these parts, as its shipping brings merchandise to and from the neighbouring coasts and from foreign parts'. That was in Norman times. Then came the Plantagenets and the close association of Bordeaux and Bristol, which is still very much alive to-day. But greater wealth through wine was to come to Bristol at the time of the Restoration, when it was enacted by 15 Car. II, cap. 7 (1665), that 'no commoditie of the growth or manufacture of Europe shall be imported into any of the Plantations unless shipped in England and in English-built shipping legally manned, and carried directly thither on pain of forfeiture'. The 'Plantations', at the time, were the West Indies and Leeward Islands, and the settlements on the mainland, New England, New York, Maryland, Carolina and Virginia.

During the whole of the seventeenth century Sack, mostly Sherris-Sack from Jerez, but also Canary Sack, was the most popular wine in England. It was imported in much greater quantities than other wines from France, Portugal or Germany; there is every reason to believe that it was practically the only wine to be re-exported from Bristol to the West Indies and America. During the eighteenth century, however, the wines of Spain lost their lead to the wines of Lisbon and Oporto, more particularly in London, Suffolk, Norfolk and Yorkshire, whilst the West of England retained much longer its predilection for the wines of Jerez.

Why the Sherry which was shipped from Bristol to the Caribbean Isles and the American mainland came to be known as 'Bristol Milk' is one of the questions which Mr. Harrison deals with, and he also gives us the official version of how *Bristol Milk*, a name which every Bristol wine-merchant has an equal right to use, became *Bristol Cream*, one of Messrs. John Harvey & Sons' registered trade marks. Mr. Harrison has done more and better than giving us an account of the rise to fame of one of the oldest Bristol firms of wine-merchants: it is, of course, his main theme and a very fascinating one as Mr. Harrison presents it to us, fascinating because he has fitted his story to the historical background of a port which has been for so long the home of bold and adventurous mariners, and of a city second to London, and London only, in its intimate connection with the wine trade, a branch of commerce long and rightly regarded as an honourable and highly respected profession. But, granting as we must, that the story which Mr. Harrison had to tell was a very interesting one, it is the manner of the telling which makes it both entertaining and convincing.

The book is a Batsford book, that is fully illustrated and charmingly produced.

ANDRÉ L. SIMON

MUGHAL MINIATURES. *By Rai Krishnadasa. India, Lalit Kala Akademi*, 1955

This is the first of a series of illustrated brochures on Indian art planned by the Lalit Kala Akademi, which has succeeded the former Bharat Kala Samiti. The general editor is Karl Khandalavala. Special attention is to be paid to the quality of the reproductions, which in this publication are certainly excellent. They are ten in number, all in colour. Each is accompanied by a note by Rai Krishnadasa, who also furnishes an introductory essay. There is another short introduction by Professor Humayun Kabir. These outline, briefly, the history and characteristics of Mughal painting over 200 years.

The miniatures illustrated, all from Indian collections, range from one of the Hamzah-Namah series, belonging to the Bharat Kala Bhavan, to an eighteenth-century version, related to some of the miniatures in the Wantage collection of South Kensington, of a well-known portrait of the Emperor Jahangir, the original of which is in the Chester Beatty collection.

Regarding the date of the Hamzah-Namah paintings, which form an important landmark in Indian Art history, about which the experts differ somewhat, Rai Krishnadasa relies on a statement of the historian Badayuni, which critics hitherto

seem to have overlooked, to prove that these were executed between 1567 and 1582. The evidence is not quite conclusive, but one can certainly agree that the series was completed at least as early as the latter date. Two of the plates are of miniatures in a fine and profusely illustrated manuscript of the Babar-Namah, of the late Akbar period, one miniature being dated 1598, acquired from St. John's College, Agra, by the National Museum, New Delhi. The Falcon (plate 4) from the Prince of Wales Museum, Bombay, is attributed to the famous Mansur, but it does not actually bear that artist's name. The *Camel fight* (plate 5), very Persian in style, is a less elaborate but much more vigorous presentation of this well-known subject than the one, attributed to the Persian master Bihzad, belonging to the Gulistan Palace, Tehran, which was closely copied in India by Nanha, and was itself related to an older original now in Istanbul[1]. Both group portraiture and individual portraiture are well represented by court subjects of the mid-century[2]. It is in this branch of painting that Mughal miniature art above all excels, and Western art, apart from that of Persia, especially in the first half of the seventeenth century certainly helped the Indian genius in its development. Perhaps both Professor Humayun Kabir and Rai Krishnadasa take too little account of the influence of Europe in the formation of the developed Mughal style. Europe supplied more than occasional hints in perspective and background colouring, though indisputably it is to India and Indian artists that the style, taking the whole period of its history, owes its main features. *At the well* (plate 9) from Sir Cowasji Jehangir's collection, though strongly influenced by Mughal art, is largely Deccani in style. It is an interesting and attractive miniature; it was shown at Burlington House in the Indian Exhibition of 1947, and it is a pleasure to see it reproduced here. The series deserves a cordial welcome.

J. V. S. WILKINSON

1. See *Persian Miniature Painting* by Binyon, Wilkinson and Gray, p. 130, plate 87, and *Ars Orientalis*, Vol. 1(1955), p. 102 and figs. 3 and 63.
2. The drawing of the lady in Plate 7 is spoilt by the large hands and left arm.

SHORT NOTES ON OTHER BOOKS

ALPHABETS FOR SIGNWRITERS, ARTISTS AND ILLUMINATORS. *By H. Oxborough and W. T. Lovegrove. Technical Press*, 1956. 14*s*

In a greatly revised 21st edition of this book the authors have collected 64 examples of lettering. The book is divided into three sections: the first on Alphabets for manuscripts; the second, General purpose alphabets, and the last Miscellaneous alphabets.

SCRIBBLING, DRAWING, PAINTING. *By W. Grozininger, Translated by Ernest Kaiser and Eithne Wilkins. Faber*, 1955. 15*s*

Originally published in Germany, this book on child art now appears in translation, with an introduction by Sir Herbert Read. There are four colour and three monochrome plates.

MYSTERIES OF SCIENCE. *By John Rowland. Werner Laurie*, 1955. 12*s* 6*d*

That 'it may really be the believer in the completely satisfactory role of science as final explainer who is behind the times', is the theme of Mr. Rowland's book. There are many phenoma which, in the author's opinion, defy scientific explanation, and many problems which have never been realistically faced by scientists.

FROM THE JOURNAL OF 1856

VOLUME IV. *23rd May*, 1856

From a paper on The British Silk Manufacture Considered in Its Commercial Aspects

The Exhibitions of 1851 and 1855 have done this good for the British silk manufacturers—they have created an appreciation of the real position of their fabrics as compared with those of France.

This was apparent in the discussion, when free and frank acknowledgment was made to French superiority. This is a hopeful sign, and betokens the right state of mind, from which improvement may be predicted. It will always be impossible for a manufacture to improve when those engaged in it fancy they do well enough already that there is no goal beyond to reach. I fully agree with the chairman, who after all pointed out the chief weakness to be remedied, when he said that the superiority of the French fabrics is to be referred to the superior intelligence of the workmen. I do not mean to say, that English weavers are not intelligent, but intelligence is to be reckoned relatively, and it would be absurd not to allow the superior intelligence of the French weaver. The fact is confirmed by his execution of difficult works, not in small quantities, or as pieces for show or curiosity, but as the staple of a province.

There is a class of goods, for which the French draw all the world to their market, which owe their excellence to the intelligence of their workmen. Till our workmen are raised by careful education to the same rank of intelligence as the French, we cannot expect to reverse the figures of exports and imports before alluded to. We may glut all markets with our plain goods, but till a special as well as general education is afforded to our weavers to qualify them for their work, the French goods will still keep their deserved place in the esteem of all buyers of taste and refinement.

Some Activities of Other Societies and Organizations

MEETINGS

THURS. 31 MAY. Visual Education, Council for, 13 Suffolk Street, Haymarket, S.W.1. 3 p.m. J. F. Wolfenden: *The Appreciation of Design.*

MON. 4 JUNE. Geographical Society, Royal, South Kensington, S.W.7. 5 p.m. Robert Steel: *Towns of Central and East Africa.*

TUES. 5 JUNE. Incorporated Plant Engineers, at the Royal Society of Arts, W.C.2. 7 p.m. G. L. Victor-Trott: *Applications of Liquid Fuel Firing.*

THURS. 7 JUNE. Anthropological Institute, Royal, 21 Bedford Square, W.C.1. 5.30 p.m. Bernard Fagg: *Rock Paintings and Rock Gongs in Northern Nigeria.*

Chemical Society, Burlington House, Piccadilly, W.1. 7.30 p.m. Prof. G. T. Seaborg: *Present Status of the Transuranium Elements.*

Endocrinology, Society for, at University College, Gower Street, W.C.1. 5.30 p.m. Dr. C. N. H. Long: *Some Studies on Experimental Obesity.*

Naval Architects, Institution of, at Weir Lecture Hall, 10 Upper Belgrave Street, S.W.1. 4.45 p.m. Commander P. Du Cane: *The Planing Performance, Pressures and Stresses in a High-Speed Launch.*

OTHER ACTIVITIES

NOW UNTIL 30 MAY. Imperial Institute, South Kensington, S.W.7. Exhibition of Current Issues: *Commonwealth Postage Stamps.*

NOW UNTIL 3 JUNE. Imperial Institute, South Kensington, S.W.7. Exhibition of Flower Studies: *Paintings and Drawings by Bursary Students of the Harold W. Sanderson Art in Industry Fund.* (See also General Note, p. 528)

NOW UNTIL 3 JUNE. Imperial Institute, South Kensington, S.W.7. *Exhibition of Paintings and Drawings of Life in Northern India by Makhan Dutta Gupta.*

MON. 28 MAY UNTIL SUN. 3 JUNE. Imperial Institute, South Kensington, S.W.7. 12.30 p.m., 1.15 p.m. and 3 p.m. Weekdays, 3 p.m. and 4 p.m. Saturdays, 3 p.m., 4 p.m. and 5 p.m. Sundays. Films: *More Precious than Gold—South Africa; British Columbia—Canada's Evergreen Playground.*

WED. 30 MAY. The Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show: *Taking the Load* (*Building Plant and Machinery*).

WED. 6 JUNE. The Building Centre, 26 Store Street, W.C.1. 12.45 p.m. Film Show: *Tiger V Excavators; Wolf 111b Excavators.*